AD A033247

THE PERCEIVED INFORMATIVENESS OF FACTUAL INFORMATION

OREGON RESEARCH INSTITUTE

Baruch Fischhoff

ADVANCED DECISION TECHNOLOGY PROGRAM

CYBERNETICS TECHNOLOGY OFFICE
DEFENSE ADVANCED RESEARCH PROJECTS AGENCY
Office of Naval Research • Engineering Psychology Programs

The objective of the Advanced Decision Technology Program is to develop and transfer to users in the Department of Defense advanced management technologies for decision making. These technologies are based upon research in the areas of decision analysis, the behavioral sciences and interactive computer graphics. The program is sponsored by the Cybernetics Technology Office of the Defense Advanced Research Projects Agency and technical progress is monitored by the Office of Naval Research — Engineering Psychology Programs. Participants in the program are:

Decisions and Designs, Incorporated
The Oregon Research Institute
Perceptronics, Incorporated
Stanford University
The University of Southern California

Inquiries and comments with regard to this report should be addressed to:

Dr. Martin A. Tolcott
Director, Engineering Psychology Programs
Office of Naval Research
800 North Quincy Street
Arlington, Virginia 22217

or

LT COL Roy M. Gulick, USMC
Cybernetics Technology Office
Defense Advanced Research Projects Agency
1400 Wilson Boulevard
Arlington, Virginia 22209

9

TECHNICAL REP[redacted] DDI-1

6

THE PERCEIVED INFORMATIVENESS OF FACTUAL INFORMATION.

by

10

Baruch Fischhoff

Sponsored by

Defense Advanced Research Projects Agency
15
~~Contract~~ N00014-76-C-0074
ARPA Order [redacted]-3052
Under Subcontract from
Decisions and Designs, Incorporated

11

Augu[redacted] [redacted]976

12 44p.

14 OFI-DDI-1

OREGON RESEARCH INSTITUTE
P.O. Box 3196
Eugene, Oregon 97403
(503) 484-2123

SUMMARY

Introduction

Before responding to a piece of information it is often reasonable to ask, "Did I learn anything from it that I didn't already know?" The experiments described in this report show a consistent tendency for people answering this question to underestimate how much they have learned. Such an "I knew it all along" bias is a more general version of the hindsight bias described in our earlier work; its effects may be seen in a variety of tasks, including the evaluation of intelligence data and the consideration of mitigating evidence. This report explores the roots and the extent of this bias and possible ways to overcome it.

Background and Approach

Any intelligence-gathering organization (or individual) must continually assess the value of the information it is receiving. As a result of these evaluations, it may decide to expand, reduce or redeploy its resources. One crucial aspect of such evaluation is asking "to what extent did we know this information to be true before it was reported?" If this assessment is biased, then the organization (or individual) will be less able to monitor its performance.

Previous research on the psychology of hindsight has shown that people underestimate how much they have learned from reports telling them how past events turned out; they have an exaggerated feeling of having known all along what would happen. They also exaggerate the extent to which other people must have known prior to the event what was going to happen. As a result, they: (1) perceive themselves as having known more than they actually did; and (2) are unduly harsh in assessing the past judgments of others.

Do people overestimate how much they knew all along about facts in general, and not just about facts regarding past events? This question was studied in three experiments involving some three hundred and twenty people who judged the informativeness of a variety of facts about general knowledge questions.

Findings and Implications

These studies found that the "knew it all along" bias affects not just hindsightful perceptions, but the evaluation of facts of many kinds. People shown a question and its answer simultaneously exaggerate the likelihood that they would have known the answer had they not been told. When people who have answered a question are later shown the question along with its answer and asked to remember their earlier response, they tend to remember having known

more than they actually did. Even the most surprising answers used in these experiments (those which no one knew) did not elicit an "I never would have known that" response. The bias appears to be quite robust. Neither exhorting people to consider their judgments more carefully nor explicitly telling them about the bias and how they might avoid it had any appreciable effect. An extensive literature review shows a number of previously unrelated phenomena found in a variety of settings to be special cases of this bias.

As extensive as it might have been, this set of experiments was but a first step at understanding this apparently pervasive phenomenon. Further research is needed to determine its generality and extent in other experimental settings; to identify real-world case studies of its impact; and to develop effective debiasing methods. The explanation offered for this bias on the basis of the current results is that once we have been told a fact, we immediately make sense out of it in the context of everything else we know about the topic in question. This integration process is so natural that it generally goes on unnoticed and cannot be easily reversed. If this is the case, then development of debiasing procedures may take considerable ingenuity.

If the bias is as robust as it seems, then decision makers should be wary of its effect--lest they undervalue the information they receive, inappropriately curtail the gathering of further information. Although we have no evidence substantiating its effectiveness, the best advice we can give at the moment on how to eliminate the bias is to ask youself when you receive a piece of information "Had I been told the opposite would I have believed it?" This method should help reveal your pre-receipt uncertainty and point to the reasons supporting the opposite answer which you now know to be wrong.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGMENTS

Helpful comments by Barbara Combs, Bernard Goiteim, Michael Hays, Sarah Lichtenstein and Paul Slovic and the programming skills of Bernie Corrigan and Mark Layman are gratefully acknowledged, as are the thoughtful observations of two anonymous reviewers.

Support for this research performed by Oregon Research Institute was provided by the Advanced Research Projects Agency of the Department of Defense and was monitored under Contract N00014-76-C-0074 with the Office of Naval Research under subcontract from Decisions and Designs, Inc.

The Perceived Informativeness of Factual Information

INTRODUCTION

Recent studies of hindsight (Fischhoff, 1975a, 1975b; Fischhoff & Beyth, 1975) have shown (1) that reporting the occurrence of an event increases the subjective probability that it was going to happen; (2) that people underestimate the effect that hearing such a report has on their perceptions. Thus, they believe that they knew all along that the reported event was going to happen, even without the benefit of the report. Feeling that one's foresight was almost as good as one's hindsight means underestimating the surprisingness of the report of what happened and what one has to learn from it. If you "knew all along" what would happen, then you do not need the report.

Underestimating what one learns from reported facts about past events may be a special case of underestimating what one learns from factual information in general. Perhaps, when we are told a fact, we often have an exaggerated feeling of having known it all along. In hindsight terms, we may believe that the facts we hear more or less had to be the answers to their respective questions, just as events reported to have happened seem as though they had to happen. One possible reason for this phenomenon is that knowing the answer to a question makes it harder to imagine other answers that we might have considered--and what would have made them seem plausible.

Such a tendency could have serious implications. If we underestimate how much we are learning from the facts presented in a particular context, we should feel less reason to go on learning. If what we learn does not surprise us, then we overestimate how much we know already. Such

exaggeration would be another expression of what Dawes (1976) has called "cognitive conceit."

The following studies looked for a "knew-it-all-along" effect with general knowledge questions taken from almanacs and encyclopedias. In Experiment 1, one group of subjects (memory) first answered a set of such questions, then were told the correct answers, and finally attempted to remember their own responses. The "reliability" group first answered and then attempted to remember their responses. However, they were not told the answers. "Hypothetical" subjects first saw the same set of questions with the answers indicated. They were then asked to respond as they would have had they not been told what the answers were.

Hypothetical subjects afflicted by a "knew-it-all-along" bias should overestimate how well they would have done on the questions had they not known the answers. Such overestimation would parallel hindsight subjects' tendency to exaggerate the probability they would have assigned to reported events had they not been told what happened (Fischhoff, 1975b). A strong enough effect might also interfere with memory subjects' ability to remember their own responses, leading them to remember having been more knowledgeable than they actually were. This effect would parallel the memory distortions found by Fischhoff and Beyth (1975) with subjects asked to recall predictions that they had made two weeks to six months previously. These subjects remembered having assigned higher probabilities to events they believed to have occurred and lower probabilities to ones they believed had not occurred than was actually the case.

Experiment 1

Method

Design. Subjects were assigned to one of three groups, memory, relia-

bility and hypothetical. In Part I of the experiment, each group was asked to answer 75 questions such as "Absinthe is (a) a precious stone; (b) a liqueur." They responded by choosing the answer which seemed most likely to be correct, and then indicating with a number from .5 to 1.0 the probability that the answer that they had chosen was correct. (Since they chose the more likely answer, their probability of being correct had to be at least .5.)

Part II immediately followed Part I. In it, all subjects received the same set of 25 questions. For memory and reliability subjects, the 25 questions were a subset of the 75 questions used in Part I. They were asked to respond to them as they had in Part I. The Part II, memory subjects found the correct answers circled, "four your [the subjects'] general information"; reliability subjects were not told the answers. For the hypotheitcal group, the test questions were unfamiliar, having been replaced in Part I by 25 other questions of similar difficulty. As with the memory group, the correct answer was indicated. The hypothetical group was asked to respond as they would have had they not been told what the answer was. They were told that their responses would "enable us [the experimenters] to evaluate the perceived difficulty of these items."

Stimuli. Questions covered a wide variety of content areas, such as history, music, geography, nature, and literature. Alternative answers were created to produce items of varying difficulty, in order to elicit a full range of probability responses. The 25 test items reflected difficulty and subject matter of the entire set used in the experiment.

Subjects. One hundred and twenty paid volunteers who had responded to an advertisement in the University of Oregon student paper participated

in the three equal-sized groups. Assignment to groups was determined by subjects' preferences for experiment time and date.

Procedure. All Part I questionnaires and answer sheets were collected and checked for completeness before distribution of Part II. Completion time was approximately 40 minutes for Part I and 20 minutes for Part II.

Results

Three measures are used in the following analyses: The proportion of alternatives selected that were, in fact, correct, P_1; the probability assigned by subjects to their selected alternative, P_2; and the probability assigned to the correct alternative, P_3. P_3 is equal to P_2 when subjects select the correct alternative and is assumed equal to $1-P_2$ when they select the wrong alternative as correct.

Reliability. Subjects' memories were quite good. For 91.4% of the questions, they remembered which alternative they had originally selected as most likely to be correct. Errors were equally divided between cases in which subjects chose the correct answer in Part I but remembered having chosen the incorrect answer (46) and cases in which the opposite was true (40). Recalled probability assessments (P_2) were also quite accurate, with a median Pearson test-retest correlation of .79 over subjects. Overall P_1, P_2, and P_3 were essentially identical for the two parts.

Figure 1 compares the mean probabilities that subjects actually assigned (Part I) with those they remembered assigning (Part II). There were no significant changes in the probabilities assigned either when they correctly remembered the answers they had selected in Part I, or when they remembered incorrectly. Interestingly, subjects tended to misremember the answers to questions about which they were least confident

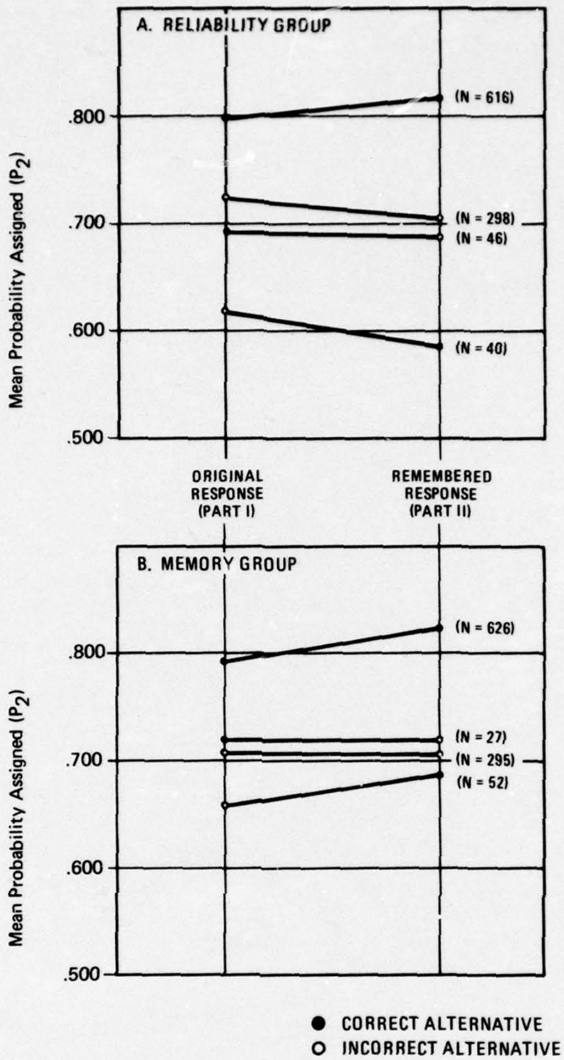


Figure 1. Experiment 1. Mean probability assigned to alternative selected according to accuracy of memory for response selected: 1a reliability, 1b memory. (e.g., there were 46 instances in which reliability subjects remembered having selected the wrong alternative when they actually selected the right one. They assigned a mean probability of approximately .69 to the alternative selected in each case.)

in Part I; this tendency was found both with initially correct answers remembered as having been wrong and originally wrong answers remembered as having been correct.

<u>Memory</u>. Most of the above analyses yielded similar results for the responses of memory subjects. Their responses were quite reliable, with median test-retest correlations of .91 and .80 for answer selected and probability assigned, respectively. Their confidence (P_2) in consistently right, consistently wrong, and incorrectly remembered answers remained unchanged (see Figure 1b).

Given the accuracy of these subjects' memories, any effect of being told the correct answer would have to be slight. The few observable differences between the memory and reliability groups were, however, in the direction of the "knew-it-all-along" hypothesis. The most striking difference was that whereas reliability subjects misremembered correct and incorrect answers equally, when memory subjects erred, it was generally in the direction of remembering having been right when, in fact, they had been wrong (52 of 79 errors). The interaction between type of error and condition (memory or reliability) was significant (χ^2 (1) = 6.55; $p < .02$.) Memory subjects remembered (in Part II) being right more often (in Part I) than reliability subjects, even though they were actually right slightly less often. (For the Part X Condition interaction, F (1, 78) = 3.20; $p < .10$.) Like the reliability group, memory subjects tended to misremember their answers for those questions about which they were least confident in Part I. For memory subjects, however, this distinction was much less pronounced, suggesting that failure to remember which answer they had selected was mediated by knowledge of the answer as well as by how confident they had been in their original selection.

For memory subjects, the probability assigned to correct alternatives (P_3) increased from .619 to .645 from Part I to Part II ($z = 1.84$). Memory subjects remembered having assigned higher P_3 than reliability subjects for 15 of 24 of the individual items (there was one tie; $p = .154$; sign test), and having been more often correct for 14 of 20 items ($p = .154$; sign test).

Hypothetical. Table 1 presents P_1, P_2, and P_3 for each of the three groups. A substantial "knew-it-all-along" effect for hypothetical subjects is apparent. These subjects believed that had they not been told the answer, they would have assigned significantly higher probabilities to the correct alternative (P_3) and would have gotten significantly more items correct (P_1) than did the subjects who actually had not been told (memory and reliability subjects in Part 1).

Figure 2 compares the mean P_3 which hypothetical subjects believe that they would have assigned to the correct alternatives of the 25 test items with the mean P_3 actually assigned by reliability and memory subjects in Part I. For 19 of 25 items, hypothetical subjects believe that they would have done better than it is reasonable to expect that they would have done (sign test; $p = .002$).

Discussion

Results for the hypothetical group show that subjects who have been told the answer to a question overestimate the likelihood that they would have known the answer without being told. In other words, they overestimate what they knew all along and underestimate what they learned from being told the answer. Apparently, we tend to underestimate what we have learned from facts of all sorts, not just those reporting the outcomes of past events (Fischhoff, 1975b).

Table 1

Mean Responses to C Items

Variable		Group				Significance of Contrast			
		R	M	R+M	H	R vs. M vs. H	R vs. M	H vs. R	H vs. R+M
P_1 = % Correct	Part I	.662	.653	.657	---	---	n.s.	---	.01[a]
	Part II	.656	.678	.667	.715	.05	n.s.	.01	.01
P_2 = Probability Assigned	Part I	.763	.760	.762	---	---	n.s.	---	n.s.
	Part II	.768	.779	.774	.755	n.s.	n.s.	n.s.	n.s.
P_3 = Probability Assigned to Correct Answer	Part I	.621	.619	.620	---	---	n.s.	---	.003[a]
	Part II	.627	.645	.636	.677	.01	n.s.	.001	.005

R = Reliability
M = Memory
H = Hypothetical

[a] This contrast is the result of comparing H responses from Part II with pooled R and M responses from Part I

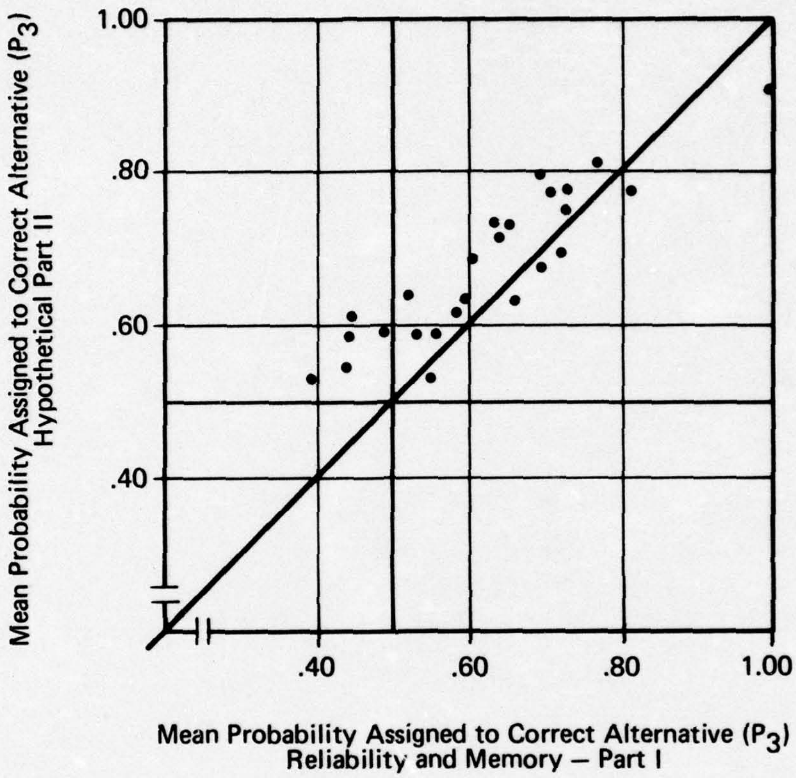


Figure 2. Item-by-item responses of hypothetical subjects in Part II (responding as if they had not been told the answer) and by reliability and memory subjects in Part I (who actually had not been told the answer).

Fischhoff and Beyth (1975) found that knowing the outcome of an event biases not only people's perceptions of how much they would have known in foresight (had they been asked), but also their recollections of how much they actually did know. Their subjects first evaluated the likelihood of various possible outcomes of President Nixon's 1972 trips to China and the Soviet Union (e.g., the probability that he would break off relations with Formosa). Later, they were unexpectedly asked to remember their own predictions and then indicate for each possible outcome whether they thought it had occurred. Their remembered probabilities were higher than the original probabilities for outcomes they believed had occurred and lower for outcomes they believed had not.

Memory results here showed weak evidence of an analogous effect. Being told the answer to a question caused subjects to remember having known slightly more than they actually had. The feebleness of this effect may in part be due to the low power of the experimental manipulation: two weeks to six months separated Fischhoff and Beyth's prediction and recall tasks, whereas in the present experiment, Part II immediately followed Part I. Subjects' memories were so good as to allow little room for distortion.

Experiment 2 attempted to increase the possibility of a memory effect by adding several tasks between Part I and Part II, thereby allowing more time for specific memories to decay. A second change was to enrich the test set. In Figure 2 the size of the effect appears to increase with question difficulty, as measured by subjects' success (P_3) in Part I. Similar effects were obtained in both Fischhoff (1975b) and Fischhoff and Beyth (1975). Experiment 2 attempted to document this effect by including items whose answers varied systematically from very difficult

($P_1 \approx 0\%$) to very easy ($P_1 \approx 100\%$). Such a design would reveal, for example, whether the answers to very difficult questions lead subjects to most strongly overestimate what they knew all along, or whether they produce a feeling of "there was no way I could have known that."

A third change was in response format. With the format used in Experiment 1 (choose the most likely answer; indicate the likelihood that it is correct), one can calculate P_3 when the response chosen is incorrect only by assuming it to be equal to $1 - P_2$ (the probability assigned to the chosen response). Given the vagaries of people's subjective probability judgments (Lichtenstein, Fischhoff, & Phillips, 1976), this assumption of complementarity may not be justified. In Experiment 2, subjects indicated the likelihood that a specified alternative for each question was the correct one. With this procedure, the probabilities assigned to correct and incorrect alternatives could be evaluated separately.

Experiment 2

Method

Design. The design used in Experiment 1 was altered in three ways: (1) for the reliability and memory groups, a set of interpolated tasks (parts of other, unrelated experiments) lasting approximately an hour separated Part II from Part I; (2) test items were chosen to provide a roughly rectangular distribution with regard to the proportion of subjects likely to know which answer was correct. This distribution included both very easy items as well as very deceptive ones (for which most subjects believed the wrong answer to be correct); and (3) subjects in each condition were randomly assigned to one of two groups. One group always estimated the probability that the first of the two possible answers

was correct (using a number from .00 to 1.00); the other group assigned a probability to the second answer of each question.

Stimuli. The 25 test items included 15 from Experiment 1, chosen according to the number of subjects answering them correctly, and 10 others designed to complete the distribution of item difficulty. These were primarily very deceptive and very easy items, both of which were scarce in Experiment 1.

Subjects. Ninety-three paid volunteers who had responded to an advertisement in the University of Oregon student paper participated.

Procedure. Same as Experiment 1.

Results

The deliberate inclusion of deceptive items in the test set led to very poor performance. In Part I, subjects assigned remarkably similar probabilities to the correct and incorrect answers of these questions (.55 and .45, respectively). The methodological concern which prompted the change of response mode appears to have had some justification. The mean probability assigned to the two alternatives of the 25 individual questions varied from .85 to 1.12 (standard deviation = .08).

Reliability. Even with the strengthened manipulation, reliability subjects' memories were quite good. They accurately remembered 66% of all Part I responses and 85% of their .00, .50, or 1.00 responses. There were no apparent differences in Part I and Part II responses other than slight regression effects which were similar for both correct and incorrect responses. Thirty of the 50 alternative answers (two for each of the 25 individual questions) had identical median probabilities in Parts I and II. The regression lines relating mean Part I (x) and Part II (y) responses were virtually identical for correct ($\tilde{y} = .99x + .03$; $r = .97$) and incorrect ($\tilde{y} = .89x + .06$; $r = .95$) alternatives.

Memory. Memory subjects' memories were also quite good. The overall proportion of correctly remembered responses (.526) was, however, significantly ($z = 5.67$) lower than that for the reliability group (.662), indicating that knowing the correct answers to the questions did interfere with their memories. Memory subjects accurately remembered less than a quarter of the original responses that were not .00, .50, or 1.00 (while correctly remembering 75.6% of those three response types).

In 72% of the cases in which they did not remember their original response, memory subjects recalled having assigned a higher likelihood to the correct answer than they actually had. Whether measured by the proportion of misremembered responses that constituted "increases" or by the extent of the increase, this tendency was greatest for the most difficult items. Comparing subjects' original and remembered responses revealed a mean increase of .178 when the original response was less than .50 and a mean increase of .002 when the original response was greater than or equal to .50. Apparently, subjects told the correct answer had difficulty remembering how they could ever have found it completely unreasonable.

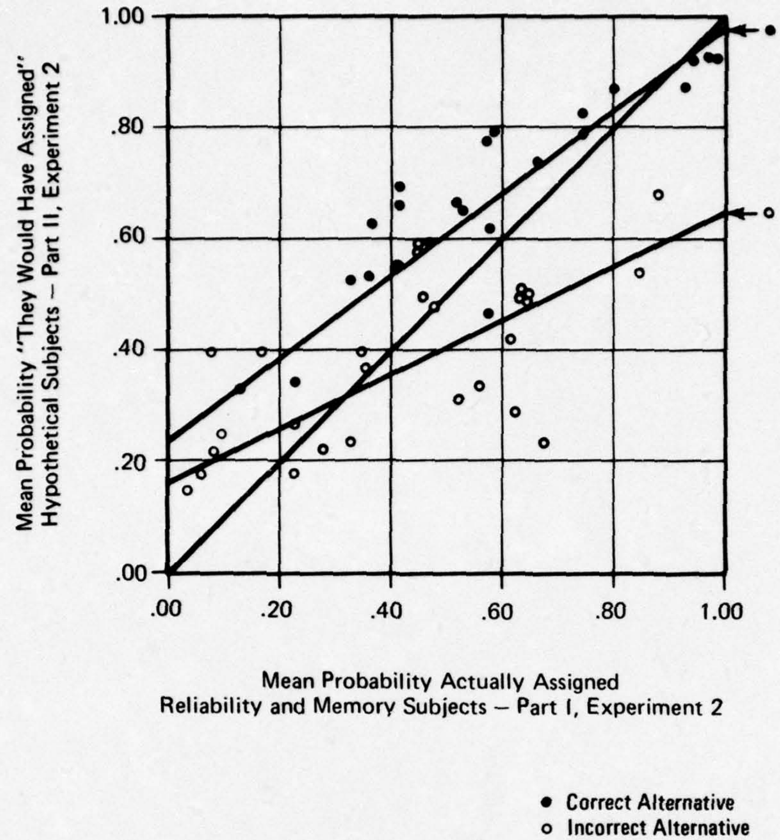
Telling subjects that particular alternatives were incorrect produced similar but appreciably weaker effects. For those wrong answers originally assigned a high probability of being correct, subjects consistently remembered having assigned lower probabilities. For other wrong answers, there was a slight tendency to remember having assigned somewhat higher probabilities than actually had been assigned. Indeed, although a significant majority of misremembered responses ($z = 2.04$) were lower than the originals, the present results might be

interpreted as regression effects. Since no such regression was found with the reliability group, provision of the correct answers might be seen as simply adding noise to subjects' memories--with incorrect items.

Hypothetical. Figure 3a compares the mean probability that hypothetical subjects believe they would have assigned to the 50 alternative answers had they not been told which were correct, with the mean probability assigned by reliability and memory subjects in Part I (who actually had not been told). As in Experiment 1, hypothetical subjects overestimated how much they would have known without being told the answer. As with the memory group, the effect was greater for correct than for incorrect alternatives (see Figure 3).

For 20 of 25 items (sign test; p = .002), hypothetical subjects believed that they would have assigned higher probabilities to correct alternatives than uninformed subjects actually did; while for 15 of 25 incorrect alternatives (sign test; p = .212), they believed that they would have assigned lower probabilities. For correct alternatives, mean hypothetical probabilities were typically .10 to .25 higher for all but the most likely alternatives (where such increases were impossible). The corresponding pattern with incorrect alternatives was much less consistent. Over the 25 items, the mean size of the "knew-it-all-along" effect was .10 for correct alternatives (.65 versus .55) and .05 for incorrect ones (.40 versus .45). Table 2 summarizes these results for the three conditions in Experiment 2.

To provide some indication of individual differences, each Part II response was scored as "biased" if it was higher than the mean Part I response for that item for a correct alternative or lower than the mean



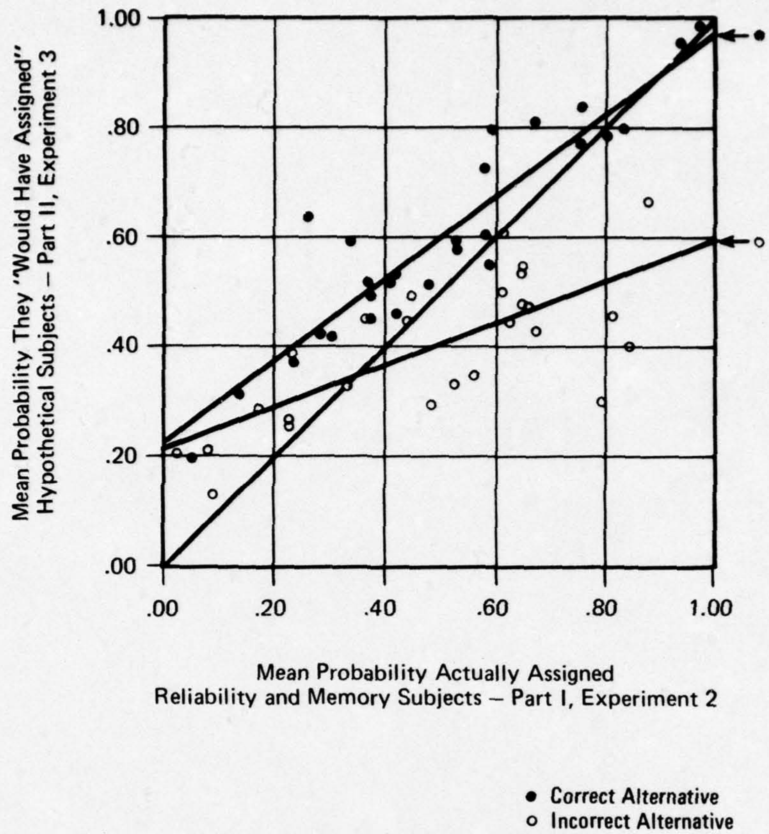
<u>Figure 3a</u>. Item-by-item responses of hypothetical subjects in Part II (responding as if they had not been told the answer) and by reliability and memory subjects in Part I (who actually had not been told the answer).

Experiment 2. Hypothetical subjects.

Regression Lines:

correct alternative $\tilde{y} = .73x + .24$, $r = .92$

incorrect alternative $\tilde{y} = .49x + .16$, $r = .65$



<u>Figure 3b</u>. Item-by-item responses of hypothetical subjects in Part II (responding as if they had not been told the answer) and by reliability and memory subjects in Part I (who actually had not been told the answer).

Experiment 3. Hypothetical subjects.

Regression Lines:

correct alternative $\tilde{y} = .74x + .24$, $r = .93$

incorrect alternative $\tilde{y} = .37x + .22$, $r = .74$

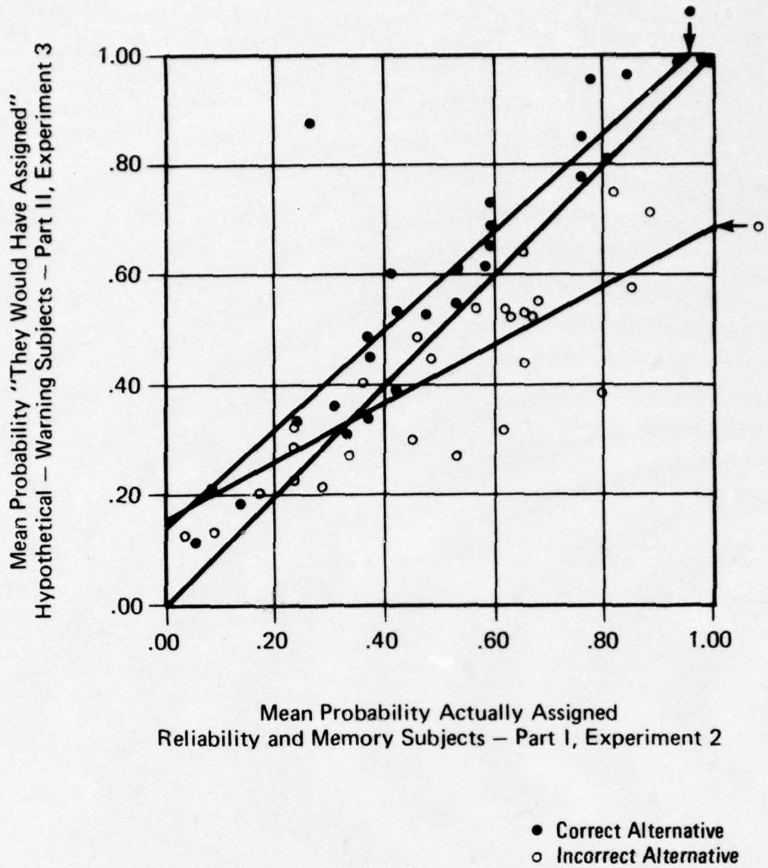


Figure 3c. Item-by-item responses of hypothetical subjects in Part II (responding as if they had not been told the answer) and by reliability and memory subjects in Part I (who actually had not been told the answer).

Experiment 3. Hypothetical-warning subjects.

Regression Lines:

correct alternative $\tilde{y} = .92x + .14$, $r = .87$

incorrect alternative $\tilde{y} = .54x + .16$, $r = .76$

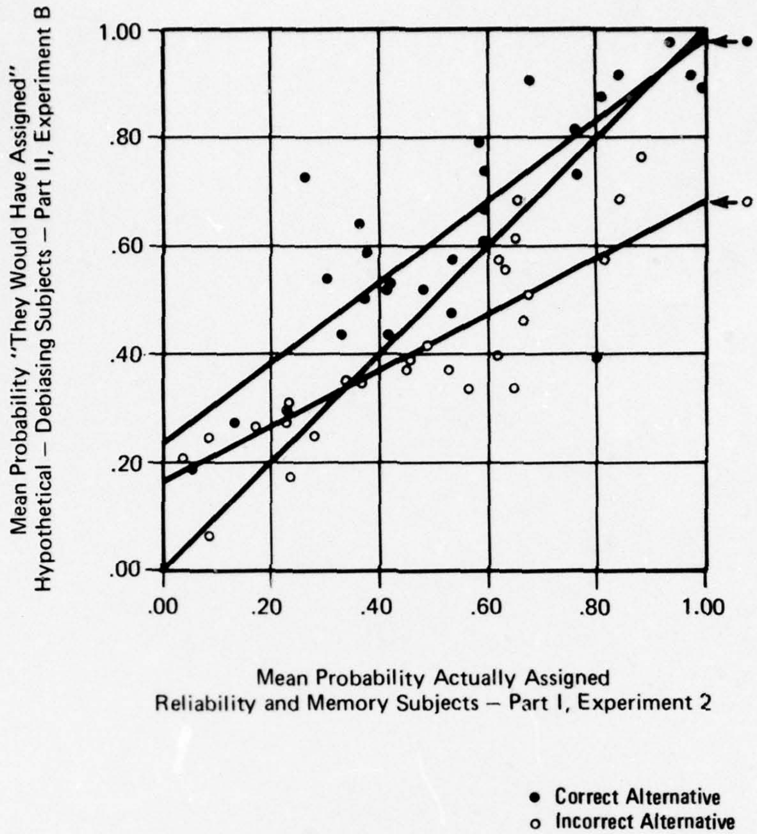


Figure 3d. Item-by-item responses of hypothetical subjects in Part II (responding as if they had not been told the answer) and by reliability and memory subjects in Part I (who actually had not been told the answer).

Experiment 3. Hypothetical-debiasing subjects.

Regression Lines:

correct alternative $\tilde{y} = .75x + .24$, $r = .88$

incorrect alternative $\tilde{y} = .52x + .16$, $r = .75$

Table 2

Mean Probabilities Assigned

Experiment 2 (25 Items)	Correct Alternative	Incorrect Alternative	No. of Responses
Part I: reliability and memory	.549	.447	1700
Part II: reliability	.570	.450	750
memory	.605	.451	950
hypothetical	.645	.396	625
Experiment 3 (27 Items)			
Part I: reliability and memory[a]	.526	.479	1836
Part II: hypothetical	.622	.396	1053
hypothetical-warning	.618	.407	918
hypothetical-debiasing	.631	.403	972

[a] These responses are from Part I of Experiment 2.

Part I response for an incorrect alternative. The number of biased responses per subject ranged from 9 to 23 (maximum = 25) with $\overline{X} = 16.3$, $s = 3.7$.

Discussion

Apparently, people do overestimate both how much they knew (memory) and would have known (hypothetical) without being told the answer to general knowledge questions. The increased interval between Part I and Part II produced numerous memory errors with reliability subjects, but no systematic biases. The same memory impairment, coupled with being told the answers, led to a substantial bias with memory subjects.

Use of items varying widely in difficulty revealed that the less likely a reported answer, the greater the effect. This result seems reasonable both because unlikely answers are more surprising and, thus, should have greater impact and because the constraints on the effect imposed by the natural limits of the probability measure (.00 and 1.00) are more distant. For example, a subject told that there are actually seven and not three dwarfs in the story of Snow White (one of the undeceptive questions) has been told very little. Nor is such a subject able to believe that he or she would have assigned that answer a probability of being correct much greater than the mean assignment of .986 by subjects who were not told the answer.

At the other extreme, subjects greatly underestimated how surprised they should be at the answers to deceptive questions. Consider, for example, the following deceptive item:

Aladdin's nationality was

a. Persian

b. Chinese

Subjects in Part I who were not told that he was Chinese assigned mean probabilities of .134 to the correct answer (b) and .838 to the wrong answer (a). In Part II, memory subjects remembered having assigned probabilities with means of .247 and .793 to (b) and (a), respectively; hypothetical subjects believed that they would have assigned probabilities with means of .321 and .542 to (b) and (a).

A surprising result of Experiment 2 was the weakness of the "knew-it-all-along" effect with incorrect answers. Although in Part II, memory and hypothetical subjects generally assigned lower probabilities to incorrect alternatives, as hypothesized, the effect was restricted to deceptive items. For the most undeceptive incorrect alternatives (those assigned low probabilities in Part I), subjects underestimated how much they knew and would have known without being told the answer. This differential effect is very intriguing particularly because it resembles a similar interaction found in Fischhoff and Beyth (1975). Their subjects showed a strong tendency to remember having given higher probabilities than they actually had to reported events, but a much weaker tendency to remember having given lower probabilities to events that had not happened. Before speculating on the source of the present interaction, it seems sensible to verify its existence. Experiment 3 contains a direct replication of the hypothetical group in Experiment 2.

Experiment 3

If the "knew-it-all-along" effect is seen as a judgmental bias, an important applied question arises, namely, what will it take to enable people to appreciate how much they have learned from reported answers? Experiment 3 attempted to answer this question by simply telling "hypothetical-debiasing" subjects about the bias and various things they

might do to reduce it. In prospect, it seemed possible that debiasing information could either achieve the desired effect or just make the subjects' task more difficult. In addition to the hypothetical group replicating Experiment 2, a "hypothetical-warning" group was exhorted to work as hard as possible. It was included as a control for the possibility that the hypothetical-debiasing group might be affected by the tone rather than the content of the debiasing instructions.

Method

Design. Three versions of the hypothetical condition of Experiment 2 were used. All subjects first responded to 75 items, assigning a probability from .00 to 1.00 to either the first or the second alternative of each. As before, the correct answer was not indicated for these Part I items. In Part II, the correct answer to each of 27 additional items was circled and subjects were asked to respond as they would have, had they not been told the answer. The hypothetical group replicated the like group in Experiment 2. The hypothetical-debiasing group was informed about the bias noted in Experiment 2 and encouraged to avoid it. As a control for the effect of heightened attention, a hypothetical-warning group, instructed to work as hard as possible, was included.

Instructions. In Part II, all three groups were told:

> On the following pages you will find a number of additional items which we intend to use in a subsequent study, identical to the one in which you just participated. Although the correct answers to these items are indicated by a circle, we would like you to respond to them as you believe you would have responded has you not been told the answer. Your responses

will enable us to evaluate the perceived difficulty of these items.

To this was added, for the warning group:

Your responses are extremely important to us. The effort you invest in them will largely determine the value of our subsequent study. Please devote as much attention to this task as you can. Thank you.

The debiasing group was also told:

On previous occasions in which we have given people this task, we have found that they exaggerate how much they have known without being told the answer. You might call this an "I-knew-it-all-along" effect.

Consider, for example, the following question:

Adaptive radiation refers to:

(a) Evolutionary changes in animal life toward increased specialization.

(b) The movement of animals to a more suitable environment for survival.

A group of people who were told that the correct answer was (a) believed that they would have assigned a probability of about .60 to (a). A group of people who were not told the answer believed that the item was a toss-up. They assigned a probability of .50 to (a).

Another group of people who were told the correct answer believed that they would have assigned a probability of .40 to (b), the incorrect answer. Again, people who were not told the answer assigned a probability of .50 to (b). As you can

see, people who were told the answer to an item assigned a higher probability to the correct answer or a lower probability to the incorrect answer than they might have if they had not been told the answer.

In completing the present questionnaire, please do everything you can to avoid this bias. One reason why it happens is that people who are told the correct answer find it hard to imagine how they ever could believe in the incorrect one. In answering, make certain that you haven't forgotten any reasons that you might have thought of in favor of the wrong answer--had you not been told that it was wrong. In addition to figuring out how the correct answer fits in with whatever else you know about each topic, devote some attention to trying to see how the incorrect answer might also have fit in.

At the other extreme, however, be careful not to overcorrect and sell yourself short by underestimating how much you would have known without the answer.

Subjects. One hundred and nine paid volunteers who responded to an advertisement in the University of Oregon student paper were assigned to the three conditions according to their preference for experimental time and data. The hypothetical-debiasing group was run last to eliminate the remote possibility that word might get out about the bias.

Stimuli. Two additional items of known difficulty (taken from Part I of Experiment 2) were added to the 25 used in Part II of Experiment 2. They filled in gaps in the distribution of item difficulty. The order of the original 25 items was varied slightly because the random order used in Experiment 2 resulted in a disproportionate number of very difficult items toward the end of the test.

Results

Hypothetical group. The responses of hypothetical subjects in Experiments 2 and 3 were generally indistinguishable. For the 25 common items, mean probability assignments from the two experiments were (.644, .637) for correct answers and (.391, .396) for incorrect answers.

Figure 3b compares the mean probabilities assigned by hypothetical subjects in Experiment 3 with those assigned by reliability and memory subjects in Part I of Experiment 2. These results replicate those in the corresponding figure (3a) from Experiment 2. Hypothetical subjects again believed that they would have assigned higher probabilities to correct answers and lower probabilities to incorrect answers than they actually would have (see also Table 2). Again, the effect seems to be greatest for the most surprising answers. And again, the effect was greater and more consistent for correct than for incorrect answers.

There was a dramatic difference in the reliability of the means for the two sorts of answers. For the 25 correct alternatives used in both experiments, the means from Experiment 2 correlated .929 with the corresponding means from Experiment 3. The accompanying regression line was indistinguishable from the identity line ($y = .998x - .008$, where x is the Experiment 2 mean and y is the Experiment 3 mean for each answer). For the 25 incorrect answers, the correlation was merely .629 ($y = .537x + .186$). This result is evidently a further reflection of the greater instability of responses to incorrect alternatives seen in Experiment 2.

Hypothetical-Warning. The warning group was included to evaluate the effect of exhorting subjects to work harder. As seen in Figure 3c

and Table 2, this manipulation had little effect. Correlations between hypothetical and hypothetical-warning means for corresponding items were .889 and .731 for correct and incorrect alternatives, respectively.

Hypothetical-Debiasing. Figure 3d and Table 2 present the responses of subjects told about the bias and how they might avoid it. Clearly, the debiasing manipulation failed. As Table 2 shows, the overall "knew-it-all-along" effect was unchanged. The pattern of results in Figure 3d is remarkably similar to those in Figures 3a, 3b, and 3c. The present means correlate .957 (correct answers) and .852 (incorrect answers) with those of hypothetical subjects (Experiments 2 and 3 combined). The only interesting results revealed by a variety of post hoc analyses were: (1) a correlation of .635 between how large the original "knew-it-all-along" effect was and how much it was reduced by the debiasing instruction--for incorrect alternatives; and (2) no correlation between the amount of debiasing for the correct and incorrect alternatives to each question, even though with hypothetical subjects the size of the "knew-it-all-along" effect was highly correlated for paired alternatives ($r = .670$).

Discussion

Experiment 3 demonstrated the robustness of the "knew-it-all-along" effect; it has again been replicated and has proved impervious to exhorting subjects to work harder or telling them to beware of overconfidence in their responses.

These results closely parallel those in the hindsight studies, and appear to be best accounted for by a generalized form of the explanation offered there (Fischhoff, 1975b). Upon hearing the answer to a question, be it "What happened next?" or "Where was Aladdin born?"

people immediately integrate that answer with whatever else they know about the topic. The purpose of this integration is to create a coherent whole out of all relevant knowledge. It may involve both reinterpreting previously held information to make sense out of it in light of the reported answer, and strengthening associative links with reasons supporting the reported answer. These processes are so natural and immediate that people do not appreciate the effect that hearing the answer has had on their perceptions. As a result, they overestimate how obvious the answer appeared (memory) or would have appeared (hypothetical) before its correctness was affirmed.

Certainly, there are times when one feels "I never would have known that" when told the answer to a question (e.g., "How do you say 'perch' in Estonian?"). Quite possibly there were at least a few hypothetical and memory subjects for whom Aladdin's nationality came as a total surprise and was recognized as such. As a group, however, they exaggerated how much they would have known without being told about even so surprising an answer. I believe that people are capable of conjuring up a feeling of having known something about the most disparate facts. Problems arise not from being able to make sense out of just about anything (which is probably quite adaptive), but from failing to realize how much one's perceptions have been restructured.

The fact that the memory effect increases from Experiment 1 to Experiment 2 to Fischhoff and Beyth (1975) as the time between the prediction and recall tasks increases from nil to one hour to weeks and months is also consistent with the present explanation. An effect is only possible with those subjects who have forgotten their original responses. Such subjects are forced to reconstruct what they said from

what they now know about the item in question; i.e., they must rely on a set of knowledge including and reorganized by the reported answer. Certainly the longer the time between the tasks, the more opportunity there is for forgetting specific responses. An additional feature of Fischhoff and Beyth (1975), conducive to a larger effect, was the fact that the particular outcomes used were all drawn from one constellation of perceptions (about the Nixon trips) which was constantly being revised as news reports were received. Thus, for example, if the trips as a whole were perceived has having been more successful than anticipated, the remembered probability that any component event was successful (e.g., will Nixon meet with Chairman Mao) may have been enhanced. With the present experiments, there is no obvious way in which receiving the answer for one general knowledge question could change subjects' perceptions of another.

The "knew-it-all-along" results might be explained as a social desirability effect, with subjects deliberately altering their Part II probability judgments in order to exaggerate the extent of their own knowledge. I find this possibility unlikely because of the non-evaluative nature of Part II instructions. Memory subjects' task in Part II was described as a test of memory, not knowledge. Hypothetical subjects were told that their responses would be used to judge the perceived difficulty of items to be used in other experiments. Hypothetical debiasing subjects were directly challenged to avoid such a bias.

The unreliability of responses to incorrect alternatives and the differential "knew-it-all-along" effect with correct and incorrect alternatives merit some consideration. The processing demands of responding to each of the two kinds of alternatives provides one possible ex-

planation. With correct alternatives, subjects are implicitly asked, "Had you not been told that this was the correct answer, how likely would you have thought that it was?" With incorrect alternatives, subjects are implicitly asked, "Had you not known that this was not the correct answer, how likely would you have thought that it was?" The latter question may simply be more difficult to handle, and therefore produces less reliable results. Jones (1966a, b) has found that subjects have difficulty following instructions with implicit negatives, a difficulty they do not attempt to overcome by independently recoding these instructions to remove the negative element (see also Clark, 1969).

An alternative explanation is that being told that an answer is right has greater impact than being told that it is wrong. Subjects not told the answer to an item presumably evaluate the relative strength of the reasons supporting both of the possible alternatives. Subjects told the answer, however, may first figure out why the correct alternative is correct, and only then devote some attention to why the other alternative is incorrect. Hypothetical and memory subjects using this procedure would rework their cognitive representations of correct alternatives more than those of incorrect ones. The less the reworking, the less the effect. An analogous possibility was raised by Fischhoff and Beyth (1975) to account for the differential effect they found with events which had and had not occurred. Non-occurrences are, in a way, non-events leading to little restructuring of one's perceptions.

A related result was reported by Craik and Tulving (1975, Experiments 1-5, 7-10). Their subjects were asked questions about a series of words (e.g., "Would the word fit in the sentence: 'He met a _____ in the street?'"), and then asked to remember the words about which

they had been questioned. Words that had elicited "yes" responses were remembered much better than those that had elicited "no" responses. Craik and Tulving explain this result by reference to Schulman's (1974) principle of encoding which holds that memory is enhanced to the extent that the word and context form an integrated unit. With "no" response words, since the "presented word does not fit the sentence frame, the subject cannot form a unified image or percept of the complete sentence, [therefore] the memory trace will not represent an integrated meaningful pattern and the word will not be well recalled" (p. 284).

The failure of the debiasing manipulation is disappointing for several reasons. Practically, it would be nice to have a procedure by which we can estimate how much we have learned from a given piece of information. Theoretically, an effective debiasing manipulation suggests (1) that the source of the bias has been understood; (2) that this understanding has been communicated; and (3) that people can use the communicated information. With an unsuccessful effort, it is unclear which of these conditions has not been fulfilled.

Assuming that in the present instance we have done our part (understanding and communicating), we must ask why our subjects could not use the debiasing information. The apparent answer is that it is extremely difficult to ignore or deprocess so important a bit of information as what the right answer is. This task is directly analogous to the challenge of ignoring inadmissible evidence improperly introduced in a trial, which, according to research by Sue, Smith, & Caldwell (1973, also Rice, 1975), cannot be done. In a related task, requiring subjects to ignore assimilated information, Zillman and Cantor (1975) found that mitigating evidence presented before a provocative act reduced retalia-

tory behavior; however, when presented after the provocation has been observed and interpreted at face value, such evidence has little effect.

Although the present debiasing instructions called for ignoring the answer, they only gave advice on how to eliminate one of its by-products: the reduced availability of reasons why the wrong answer might have been the right one. The ingenuity needed to eliminate biases may be seen in Ross, Lepper, and Hubbard's (1975) studies of the effectiveness of debriefing procedures. Their subjects first received false feedback indicating that they had succeeded or failed to discriminate suicide notes according to their authenticity. Both the subjects and observers of the experiment were then thoroughly debriefed about the nature of the feedback. Following a standard debriefing about the nature of the experiment and how it had been rigged, both the actors and the observers still believed their initial impressions (created by the false feedback) about the subjects' discriminatory ability. However, a debriefing session that included an explicit discussion of why the initial impressions persevered and how they might be attenuated largely eliminated these erroneous perceptions.

More work is needed on the general problem of how people answer hypothetical questions of the form "What would I know if I did not know (some fact)?" Although some current theories show how semantic memory might be restructured to integrate new information (e.g., Anderson and Bower, 1973), none offers concrete suggestions about how the effects of integration might be undone. Such research would expand our understanding of hindsight, inadmissible and mitigating evidence, debriefing, and the perceived informativeness of factual information. It would also

improve our understanding of the way in which cognitive representations are restructured to include new information, and of the reversibility of that restructuring. The questions to be asked are fairly obvious. Unfortunately, we may not fully appreciate how much we have learned when we manage to answer them.

REFERENCES

Anderson, J. R., & Bower, G. H. Human Associative Memory. Washington, D. C.: Winston, 1973.

Clark, H. H. "The Influence of Language in Solving Three-Term Series Problems." Journal of Experimental Psychology, 82 (1969), 205-215.

Craik, F. I. M., & Tulving, E. "Depth of Processing and the Retention of Words in Episodic Memory." Journal of Experimental Psychology: General, 104 (1975), 268-294.

Dawes, R. M. "Shallow Psychology." In J. S. Carroll and J. W. Payne, eds. Cognition and Social Behavior. Hillsdale, N. J.: Lawrence Erlbaum Associates, 1976.

Fischhoff, B. "Hindsight: Thinking Backward?" Psychology Today, 8 (1975), 4. (a)

Fischhoff, B. "Hindsight ≠ Foresight." Journal of Experimental Psychology: Human Perception and Performance, 1 (1975), 288-299. (b)

Fischhoff, B., & Beyth, R. "'I knew it would happen'--Remembered Probabilities of Once-Future Things." Organizational Behavior and Human Performance, 13 (1975), 1-16.

Jones, S. "Decoding a Deceptive Instruction." British Journal of Psychology, 57 (1966a), 405-411.

Jones, S. "The Effect of a Negative Qualifier in an Instruction." Journal of Verbal Learning and Verbal Behaviour, 5 (1966b), 497-501.

Lichtenstein, S., Fischhoff, B., & Phillips, L. D. "Calibration of Probabilities: The State of the Art." In H. Jungerman and G. de Zeeuw, eds. Proceedings of the Fifth Conference on Subjective Probability, Utility, and Decision Making, in press.

Rice, M. F. "The Influence of Irrelevant Biographical Information on Teacher Evaluation." Journal of Educational Psychology, 67 (1975), 658-662.

Ross, L., Lepper, M. R., & Hubbard, M. "Perseverance in Self-perception and Social Perception: Biased Attributional Processes in the Debriefing Paradigm." Journal of Personality and Social Psychology, 32 (1975), 880-892.

Schulman, A. I. "Memory for Words Recently Classified." Memory and Cognition, 2 (1974), 47-52.

Sue, S., Smith, R. E., & Caldwell, C. "Effects of Inadmissible Evidence on the Decisions of Simulated Jurors: A Moral Dilemma." Journal of Applied Social Psychology, 3 (1973), 345-353.

Zillman, D., & Cantor, J. "Effect of Timing of Information About Mitigating Circumstances on Emotional Responses and Retaliatory Behavior." Journal of Experimental Social Psychology, 12 (1976), 38-55.

Research Distribution List

Department of Defense

Assistant Director (Environment and Life Sciences)
Office of the Deputy Director of Defense Research and Engineering (Research and Advanced Technology)
Attention: Lt. Col. Henry L. Taylor
The Pentagon, Room 3D129
Washington, DC 20301

Office of the Assistant Secretary of Defense (Intelligence)
Attention: CDR Richard Schlaff
The Pentagon, Room 3E279
Washington, DC 20301

Director, Defense Advanced Research Projects Agency
1400 Wilson Boulevard
Arlington, VA 22209

Director, Cybernetics Technology Office
Defense Advanced Research Projects Agency
1400 Wilson Boulevard
Arlington, VA 22209

Director, Program Management Office
Defense Advanced Research Projects Agency
1400 Wilson Boulevard
Arlington, VA 22209
(two copies)

Administrator, Defense Documentation Center
Attention: DDC-TC
Cameron Station
Alexandria, VA 22314
(12 copies)

Department of the Navy

Office of the Chief of Naval Operations (OP-987)
Attention: Dr. Robert G. Smith
Washington, DC 20350

Director, Engineering Psychology Programs (Code 455)
Office of Naval Research
800 North Quincy Street
Arlington, VA 22217
(three copies)

Assistant Chief for Technology (Code 200)
Office of Naval Research
800 N. Quincy Street
Arlington, VA 22217

Office of Naval Research (Code 230)
800 North Quincy Street
Arlington, VA 22217

Office of Naval Research
Naval Analysis Programs (Code 431)
800 North Quincy Street
Arlington, VA 22217

Office of Naval Research
Operations Research Programs (Code 434)
800 North Quincy Street
Arlington, VA 22217

Office of Naval Research (Code 436)
Attention: Dr. Bruce McDonald
800 North Quincy Street
Arlington, VA 22217

Office of Naval Research
Information Systems Program (Code 437)
800 North Quincy Street
Arlington, VA 22217

Office of Naval Research (ONR)
International Programs (Code 1021P)
800 North Quincy Street
Arlington, VA 22217

Director, ONR Branch Office
Attention: Dr. Charles Davis
536 South Clark Street
Chicago, IL 60605

Director, ONR Branch Office
Attention: Dr. J. Lester
495 Summer Street
Boston, MA 02210

Director, ONR Branch Office
Attention: Dr. E. Gloye and Mr. R. Lawson
1030 East Green Street
Pasadena, CA 91106
(two copies)

Dr. M. Bertin
Office of Naval Research
Scientific Liaison Group
American Embassy – Room A-407
APO San Francisco 96503

Director, Naval Research Laboratory
Technical Information Division (Code 2627)
Washington, DC 20375
(six copies)

Director, Naval Research Laboratory (Code 2029)
Washington, DC 20375
(six copies)

Scientific Advisor
Office of the Deputy Chief of Staff
for Research, Development and Studies
Headquarters, U.S. Marine Corps
Arlington Annex, Columbia Pike
Arlington, VA 20380

Headquarters, Naval Material Command (Code 0331)
Attention: Dr. Heber G. Moore
Washington, DC 20360

Headquarters, Naval Material Command (Code 0344)
Attention: Mr. Arnold Rubinstein
Washington, DC 20360

Naval Medical Research and Development Command (Code 44)
Naval Medical Center
Attention: CDR Paul Nelson
Bethesda, MD 20014

Head, Human Factors Division
Naval Electronics Laboratory Center
Attention: Mr. Richard Coburn
San Diego, CA 92152

Dean of Research Administration
Naval Postgraduate School
Monterey, CA 93940

Naval Personnel Research and Development Center
Management Support Department (Code 210)
San Diego, CA 92152

Naval Personnel Research and Development Center (Code 305)
Attention: Dr. Charles Gettys
San Diego, CA 92152

Dr. Fred Muckler
Manned Systems Design, Code 311
Navy Personnel Research and Development Center
San Diego, CA 92152

Human Factors Department (Code N215)
Naval Training Equipment Center
Orlando, FL 32813

Training Analysis and Evaluation Group
Naval Training Equipment Center (Code N-00T)
Attention: Dr. Alfred F. Smode
Orlando, FL 32813

Department of the Army

Technical Director, U.S. Army Institute for the Behavioral and Social Sciences
Attention: Dr. J.E. Uhlaner
1300 Wilson Boulevard
Arlington, VA 22209

Director, Individual Training and Performance Research Laboratory
U.S. Army Institute for the Behavioral and and Social Sciences
1300 Wilson Boulevard
Arlington, VA 22209

Director, Organization and Systems Research Laboratory
U.S. Army Institute for tha Behavioral and Social Sciences
1300 Wilson Boulevard
Arlington, VA 22209

Department of the Air Force

Air Force Office of Scientific Research
Life Sciences Directorate
Building 410, Bolling AFB
Washington, DC 20332

Robert G. Gough, Major, USAF
Associate Professor
Department of Economics, Geography and Management
USAF Academy, CO 80840

Chief, Systems Effectiveness Branch
Human Engineering Division
Attention: Dr. Donald A. Topmiller
Wright-Patterson AFB, OH 45433

Aerospace Medical Division (Code RDH)
Attention: Lt. Col. John Courtright
Brooks AFB, TX 78235

Other Institutions

The Johns Hopkins University
Department of Psychology
Attention: Dr. Alphonse Chapanis
Charles and 34th Streets
Baltimore, MD 21218

Institute for Defense Analyses
Attention: Dr. Jesse Orlansky
400 Army Navy Drive
Arlington, VA 22202

Director, Social Science Research Institute
University of Southern California
Attention: Dr. Ward Edwards
Los Angeles, CA 90007

Perceptronics, Incorporated
Attention: Dr. Amos Freedy
6271 Variel Avenue
Woodland Hills, CA 91364

Director, Human Factors Wing
Defense and Civil Institute of
Environmental Medicine
P.O. Box 2000
Downsville, Toronto
Ontario, Canada

Stanford University
Attention: Dr. R.A. Howard
Stanford, CA 94305

Montgomery College
Department of Psychology
Attention: Dr. Victor Fields
Rockville, MD 20850

General Research Corporation
Attention: Mr. George Pugh
7655 Old Springhouse Road
McLean, VA 22101

Oceanautics, Incorporated
Attention: Dr. W.S. Vaughan
3308 Dodge Park Road
Landover, MD 20785

Director, Applied Psychology Unit
Medical Research Council
Attention: Dr. A.D. Baddeley
15 Chaucer Road
Cambridge, CB 2EF
England

Department of Psychology
Catholic University
Attention: Dr. Bruce M. Ross
Washington, DC 20017

Stanford Research Institute
Decision Analysis Group
Attention: Dr. Allan C. Miller III
Menlo Park, CA 94025

Human Factors Research, Incorporated
Santa Barbara Research Park
Attention: Dr. Robert R. Mackie
6780 Cortona Drive
Goleta, CA 93017

University of Washington
Department of Psychology
Attention: Dr. Lee Roy Beach
Seattle, WA 98195

Eclectech Associates, Incorporated
Post Office Box 179
Attention: Mr. Alan J. Pesch
North Stonington, CT 06359

Hebrew University
Department of Psychology
Attention: Dr. Amos Tversky
Jerusalem, Israel

Dr. T. Owen Jacobs
Post Office Box 3122
Ft. Leavenworth, KS 66027

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)

The Perceived Informativeness of Factual Information

5. TYPE OF REPORT & PERIOD COVERED

Technical

6. PERFORMING ORG. REPORT NUMBER

ORI Report No.: DDI-1

7. AUTHOR(s)

Baruch Fischhoff

8. CONTRACT OR GRANT NUMBER(s)

Prime Contract No.:
N00014-76-C-0074
Subcontract No.: 75-030-0712

9. PERFORMING ORGANIZATION NAME AND ADDRESS

Oregon Research Institute
P. O. Box 3196
Eugene, Oregon 97403

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS

Defense Advanced Research Projects Agency
1400 Wilson Blvd.
Arlington, Va. 22209

12. REPORT DATE

August 1976

13. NUMBER OF PAGES

45

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)

Office of Naval Research
800 North Quincy Street
Arlington, VA 22217

15. SECURITY CLASS. (of this report)

Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Support for this research performed by Oregon Research Institute was provided by the Advanced Research Projects Agency of the Department of Defense and was monitored under Contract N00014-76-C-0074 with the Office of Naval Research under subcontract from Decisions and Designs, Inc.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Information
Hindsight bias
Hypothetical judgments
Debiasing
Intelligence Evaluation

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Subjects told the correct answer to two-alternative general knowledge questions (e.g., Absinthe is (a) a precious stone, (b) a liqueur) were found to overestimate both the likelihood that they would have known the answer had they not been told and the likelihood that they did know the correct answer before being told. Attempts to undo this "knew-it-all-along" effect by exhorting subjects to work harder or telling them about it failed. These results were discussed as representative of those obtained in a general class of tasks in which people are called upon to disregard information which they have already processed.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)